INTERNATIONAL STANDARD

ISO 289-3

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Rubber, unvulcanized — Determinations using a shearing-disc viscometer —

Part 3:
Determination of the Delta Mooney value for non-pigmented, oil-extended, emulsion-polymerized SBR

Caoutchouc non vulcanisé — Déterminations utilisant un consistomètre à disque de cisaillement —

Partie 3: Détermination de la valeur Delta Mooney pour le caoutchouc styrène-butadiène en émulsion, étendu à l'huile, non pigmenté

Reference number
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International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 289-3 was prepared by ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 2, *Physical and degradation tests*.

ISO 289 consists of the following parts, under the general title *Rubber, unvulcanized — Determinations using a shearing-disc viscometer*:

— *Part 1: Determination of Mooney viscosity*

— *Part 2: Determination of pre-vulcanization characteristics*

— *Part 3: Determination of the Delta Mooney value for non-pigmented, oil-extended, emulsion-polymerized SBR*

Introduction

The Delta Mooney value provides a means of predicting the behaviour, or processibility, of rubber during the primary stages of mixing, extruding and calendering. It is usually associated with non-pigmented, oil-extended emulsion styrene-butadiene rubber, but it can be of use in providing information about the behaviour of other types. In the latter case, however, the conditions of test specified in this part of ISO 289 may not be suitable.

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WARNING — Persons using this part of ISO 289 should be familiar with normal laboratory practice. This part of ISO 289 does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This part of ISO 289 specifies a method for determining the Delta Mooney value of non-pigmented, oil-extended emulsion-polymerized styrene-butadiene rubber.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 289. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 289 are encouraged to investigate the possibility of applying the most recent editions of the normative documents listed below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 289-1:1994, *Rubber, unvulcanized — Determinations using a shearing-disc viscometer — Part 1: Determination of Mooney viscosity.*

ISO 1795 :—[1], *Rubber, raw, natural and synthetic — Sampling and further preparative procedures.*

3 Terms and definitions

For the purposes of this part of ISO 293, the following terms and definitions apply:

3.1
Delta Mooney A values

A1 value
the difference between the Mooney viscosities of an **unmassed** test sample recorded at 15 min and 1 min, i.e. ML(1+15) – ML(1+1)

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1) To be published. (Revision of ISO 1795:1992)

A2 value
the difference between the Mooney viscosities of an **unmassed** test sample recorded at 7 min and 1 min, i.e. ML(1+7) – ML(1+1)

A3 value
the difference between the Mooney viscosities of a **massed** test sample recorded at 15 min and 1,5 min, i.e. ML(1+15) – ML(1+1,5)

3.2
Delta Mooney B value
the difference between the minimum Mooney viscosity soon after starting the rotor and the subsequent maximum Mooney viscosity for an **unmassed** test sample (see Figure 1)

NOTE The values are complementary, and any combination may be used to assist in distinguishing those rubbers that are easy to process from those that process with significantly greater difficulty.

4 Principle

The test consists of determining the difference between the Mooney viscosity values at two specified times (Delta Mooney A) or at two specified points on the curve of Mooney viscosity against time (Delta Mooney B).

5 Apparatus

Use the apparatus specified in, and calibrated in accordance with, ISO 289-1.

6 Preparation of test specimen

Ensure that the unmassed test sample is free from entrapped air and that the surface is smooth and regular, thereby avoiding air entrapment between the test specimen and the rotor or die surfaces. This may be achieved by compacting the test sample in a mould for 5 min at 23 °C ± 2 °C, followed by a relaxation period of 15 min.

Prepare the massed test sample as described in ISO 1795.

Prepare the test specimen from the test sample as described in ISO 289-1.

7 Test temperature

The test temperature shall be 100 °C ± 0,5 °C, this being the temperature of the closed dies with the rotor in place and the cavity empty.

8 Procedure

Conduct the test following the procedure described in ISO 289-1, using the large rotor, a preheating time of 1 min and a running time of either 7 min or 15 min.

If the viscosity has not been recorded continuously, plot the observed Mooney viscosity values as specified in ISO 289-1.

NOTE An automatic recorder is strongly recommended.

9 Calculation and expression of results

Determine the Delta Mooney A1 value as the difference between the Mooney viscosities recorded at running times of 15 min and 1 min.

Determine the Delta Mooney A2 value as the difference between the Mooney viscosities recorded at running times of 7 min and 1 min.

Determine the Delta Mooney A3 value as the difference between the Mooney viscosities recorded at running times of 15 min and 1,5 min.

Determine the Delta Mooney B value as the difference between the minimum and maximum Mooney viscosities (see Figure 1).

NOTE For Delta Mooney A, lower (in most cases more negative) values are indicative of easier-processing rubbers. For Delta Mooney B, lower values also indicate easier processing.

10 Test report

The test report shall include the following information:

a) all details necessary for complete identification of the rubber tested, including whether the test sample was compacted or not;

b) a reference to this part of ISO 289, i.e. ISO 289-3;

c) the model of viscometer used and the name of the manufacturer;

d) the Delta Mooney A1, A2, A3 and/or B value;

e) details of any operation not included in this part of ISO 289, as well as any operation regarded as optional;

f) the date of the test.

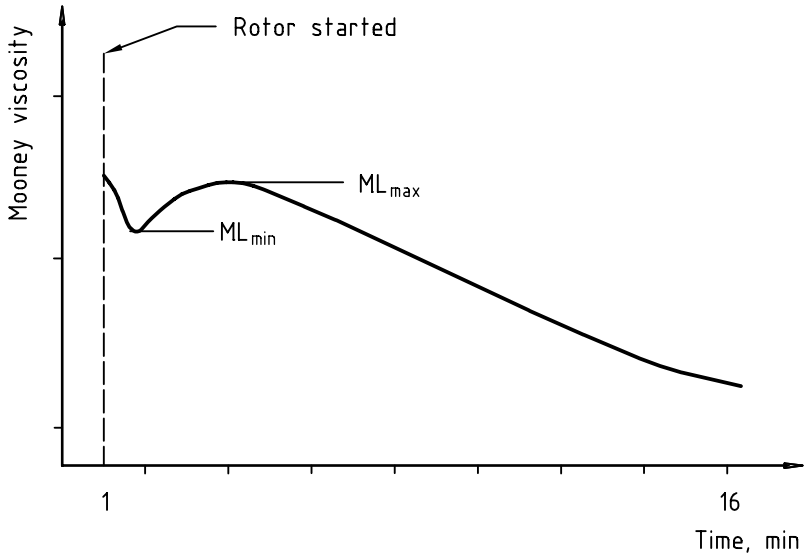

Figure 1 — Mooney viscosity plot

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